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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re Application of:

Applicants:	:	Alan Wirth and Andrew Jankevics
Serial No.	:	10/777,476
Filing Date	:	February 12, 2004
Title of Invention	:	FREE SPACE OPTICAL (FSO) LASER COMMUNICATION SYSTEM EMPLOYING FADE MITIGATION MEASURES BASED ON LASER BEAM SPECKLE TRACKING AND LOCKING PRINCIPLES
Examiner	:	n/a
Group Art Unit	:	2876
Attorney Docket No.	:	108-205USA000

Honorable Commissioner of Patents
and Trademarks
Washington, DC 20231

INFORMATION DISCLOSURE STATEMENT
UNDER 37 C.F.R. 1.97

Sir:

In order to fulfill Applicants' continuing obligation of candor and good faith as set forth in 37 C.F.R. 1.56, Applicants submit herewith an Information Disclosure Statement prepared in accordance with 37 C.F.R Sections 1.97, 1.98 and 1.99.

The disclosures enclosed herewith are as follows:

U.S. PUBLICATIONS

NUMBER	FILING DATE	TITLE
6,570,692	January 22, 2002	COMMUNICATION NETWORK BASED ON THE ATMOSPHERIC TRANSMISSION OF LIGHT
6,568,647 B2	January 25, 2001	MOUNTING APPARATUS FOR A DEFORMABLE MIRROR
6,559,993 B2	January 22, 2002	OPTICAL ROUTER FOR A LIGHT-BSED COMMUNICATION NETWORK
6,464,364	January 25, 2001	DEFORMABLE CURVATURE MIRROR
6,452,145 B1	May 26, 2000	METHOD AND APPARATUS FOR

		WAVEFRONT SENSING
6,373,607 B1	May 22, 1998	LIQUID CRYSTAL VARIABLE RETARDER FOR FREE-SPACE LASER COMMUNICATION SYSTEM
6,348,986 B1	June 29, 1998	WIRELESS FIBER-COUPLED TELECOMMUNICATION SYSTEMS BASED ON ATMOSPHERIC TRANSMISSION OF LASER SIGNALS
6,323,980 B1	March 5, 1998	HYBRID PICOCELL COMMUNICATION SYSTEM
6,043,918	December 12, 1997	LASER SATELLITE COMMUNICATION SYSTEMS
5,801,866	June 21, 1996	LASER COMMUNICATION DEVICE
5,786,923	March 29, 1996	POINT-TO-MULTIPOINT WIDE AREA TELECOMMUNICATION SNETWORK VIA ATMOSPHERIC LASER TRANSMISSION THROIUGH A REMOTE OPTICAL ROUTER
5,661,582	October 26, 1995	PROTONIC INTERCONNECT AND PROTONIC PROCESSING FOR COMMUNICATIONS AND DATA HANDLING SATELLITES
5,218,467	December 28, 1990	MULTI-ACCESS-LASER COMMUNICATIONS TRANSCEIVER SYSTEM
5,119,225	June 18, 1989	MULTIPLE ACCESS COMMUNICATION SYSTEM
4,928,317	October 14, 1988	RADIO-OPTICAL TRANSMISSION SYSTEM, IN PARTICULAR FOR SPACE TELECOMMUNICATIONS
4,491,982	July 16, 1982	TERRESTRIAL LIGHT BEAM COMMUNICATION SYSTEM

FOREIGN APPLICATIONS

WO 02/0059674 A1 January 22, 2002 DEFORMABLE CURVATURE MIRROR

TECHNICAL PUBLICATIONS

Scientific publication entitled "Chaotic Free-Space Laser Communication over a Turbulent Channel" by N.F. Rulkov, M.A. Voronstsov, and L. Illing, PHYSICAL REVIEW LETTERS, Vol. 89, No. 27, December 30, 2002, 4 pages.

Scientific publication entitled "Three-Dimensional Modeling of Optical Turbulence" by Frank H. Ruggiero and Daniel A. DeBenedictis, Users Group Conference, 2000, pages 1-9.

STATEMENT OF PERTINENCE

U.S. Patent No. 6,570,692 B2 discloses a point-to-multipoint by-directional wide area telecommunications network employing atmospheric optical communication. The network comprises a primary transceiver unit, a plurality of subscriber transceiver units and an optical router. The primary transceiver unit may send data destined for the subscriber transceiver units through the optical router, and the subscriber transceiver units may send data destined for the primary transceiver unit through the optical router. The primary transceiver unit and optical router communicate by means of light beams which are transmitted through the atmosphere. Similarly, the optical router and the subscriber transceiver units communicate by means of light beams which are transmitted through the atmosphere.

U.S. Patent No. 6,568,647 B2 to Graves et al. discloses a mounting apparatus for a deformable mirror that has a peripheral mounting portion with oppositely facing and parallel mounting surfaces. A base member and a mounting ring have juxtaposed peripheral flange portions with rubber o-rings for engaging the parallel mounting surfaces of the mirror. A plurality of set screws are provided in the base member and the mounting ring in the peripheral flange portions and engage the o-rings for applying and adjusting a mounting force to the mounting surfaces of the mirror. The base member is also provided with set screws in the perimeter for engaging and centering the mirror.

U.S. Patent No. 6,559,993 B2 to Doucet et al. discloses a point-to-multipoint bi-directional wide area telecommunications network employing atmospheric optical communication. The network comprises a primary transceiver unit, a plurality of subscriber transceiver units and an optical router. The primary transceiver unit may send data destined for the subscriber transceiver units through the optical router, and the subscriber transceiver units may send data destined for the primary transceiver and through the optical router. The primary transceiver unit and optical router communicate by means of light beams which are transmitted through the atmosphere. Similarly, the optical router and the subscriber transceiver units communicate by means of light beams which are transmitted through the atmosphere.

U.S. Patent No. 6,464,364 B2 to Graves et al. discloses a deformable curvature mirror capable of controlled deformation by applying electrical voltages to electrode segments on the

back of the mirror. Two plates of an electro-restrictive material, such as PZT or PMN, are jointed together with at least one conductive layer sandwiched therebetween. One plate has an outer conductive layer and a mirrored surface on the outer conductive layer. The conductive layers are electrically grounded. The other plate has a pattern of plurality of electrode segments on the outer surface with each electrode segment having a separate electrical terminal for applying a variable electrical voltage thereto for separately transmitting a variable current through each electrode segment and through at least the other plate for causing variable expansion of the plate and thereby selectively deforming that plate and, in turn, the deformable curvature mirror.

US Patent No. 6,452,145 B1 to Graves et al. discloses a wavefront sensor for detecting the wavefront produced by light waves from a light source which comprises optically refractory or reflective means for receiving the light waves from the light source and producing two defocused pupil images at two different locations along an optical axis. A detector is positioned at a location spaced from the two locations of the two focused pupil images for the doctor rmeans to resolve and detect two equally and oppositely defocused pupil images. A computer with appropriate software processes the characteristics of the two defocused pupil images from the detector to determine the curvature of the wavefront based on the light intensities with Dirichler's boundary conditions for the light waves received by the wavefront sensor.

U.S. Patent 6,373,607 B1 to Rivers et al. discloses a liquid crystal variable retarder with automatic gain control for use with an imager-based target tracking application such as a free-space laser communication system. An LCVR is made of two optical windows separated by a gap, typically of a few microns, The gap is filled with nemantic liquid crystal material. Electrodes are situated to enable an electric field to be applied between the optical windows and thus across the liquid crystal material. With no voltage applied to the electrodes the liquid crystals lie parallel to the optical windows. In this state of operation, the LCVR exhibits maximus retardation. As voltage is applied to the electrodes, the liquid crystal molecules rotate away from the optical windows, becoming perpendicular to the vertical windows. In this state of operation, the LCVR exhibits minimum retardation. A preferred embodiment of the invention includes an optical train having a first polarizer, a filter, a second polarizer orthogonal to the first polarizer, a liquid crystal variable retarder, and a third polarizer orthogonal to the second polarizer. The light then passes through focusing optics that image the light onto an imaging array, such as CCD device, or a photodetector. A feedback circuit controls the liquid crystal variable retarder to provide variable attenuation of an incoming light beam.

U.S. Patent No. 6,348,986 B1 to Doucet et al. discloses a wireless optical transceiver system which includes a passive optical antenna coupled by optical fiber to an active electronics module. The transceiver system receives and transmits light beams from/to the atmosphere, and thereby communicates optically with a second optical transceiver. Receivers, transmitters, repeaters, switches, routers, etc., may be similarly organized, i.e. by coupling one or more passive optical antennas and an active electronics module with fiber-optic cable. Furthermore, various network topologies and organizations may be arranged using one or more of the fiber-coupled transceivers, receivers, transmitters, repeaters, switches, routers, etc. Such components are admirably suited for use in various network configurations such s broadcast networks, point-to-multipoint networks, etc. due to their low cost, ease of installation and antenna sighting, modularity, and upgradagility. An optical router for establishing wireless channels to a number of subscribers may be configured based on demodulation and remodulation of light beams, or

alternatively by redirecting light beams by adjustable deflections minors. A communications network infra-structure based on atmospheric light beam propagation is contemplated.

U.S. Patent No. 6,323,980 B1 to Bloom discloses a free-space laser communication system. The system is comprised of a large number of picocells. Each picocell comprises a base station providing conventional communication with at least one user but typically several or many users. Each base station comprises at least two laser transceivers, each transceiver having a point mechanism for automatic alignment. These transceivers provide communication with other base stations, relay information between other base stations or transmit information to conventional communication systems. The picocells cover relatively small geographical ranges such as above 100 meters. Applicant has demonstrated that, at these distances, atmospheric effects alternating laser beams are not a serious problem. In a preferred embodiment the base stations generally comprise four laser transceivers with micro processor controlled printing equipment which are aligned automatically to point at other base stations and an RF transceiver to provide communication with users. The present invention is especially suited for providing a communication system, which can be almost immediately installed to compete with established local monopoly (or near monopoly) telephone systems. Systems according to the present invention can be installed within a few hours or a very few days. These systems can provide, for a local area, its first communication system, or provide communication services in a local area in the event an existing local system is damaged such as in a natural disaster or provide a quick temporary expansion of existing communication capacity.

U.S. Patent No. 6,043,918 to Bezzay et al. discloses a laser satellite communication system which avoids atmospheric, wind and turbulence effects. A satellite or high altitude platform communicating system includes an earthorbiting satellite or high altitude platform carrying a loser communication receiver and an acknowledgement transmitter. A ground terminal having a laser communications transmitter which is caused to continuously transmit large data block signals. When one block of data signals is received at the satellite or platform, an acknowledgement signal is sent to earth from the satellite or platform. The ground terminal receives the acknowledgement signal and causes the ground terminal laser communication transmitter to continuously transmit the next succeeding large block data signals. This process is repeated until all of the data has been received by the earth-orbiting satellite or high altitude platform, whereby all of the large data block signals are received by the laser communication receiver through scintillation windows in the atmosphere.

U.S. Patent No. 5,801,866 to Chan et al. discloses a portable laser communication transceiver for transmitting and receiving information imposed on laser beams. A communicative signal is imposed on a laser beam having a divergence of between 1 degree and 4 degrees. The beam is directed by an operator, sighting through a telescopic viewing device, at a distant transceiver which collects light in the laser beam. In preferred embodiments, the transceivers are handheld and each comprises a microphone and earphones allowing operators to talk with each other. Digital information can also be transmitted from personal computers and other electronic information equipment at the location of each operator. In a preferred embodiment useful for military and surveying applications, a GPS, a compass and a laser ranging system is provided. This enables the operator to sight through a binocular to a target and determine its position in longitude, latitude and elevation. Target position information can then be transmitted to a distant transceiver which in this case could be a base transceiver.

U.S. Patent No. 5,786,923 to Doucet et al. discloses a point-to-multipoint bi-directional wide area telecommunications network employing atmospheric optical communication. The network comprises a primary transceiver unit, a plurality of subscriber transceiver units and an optical router. The primary transceiver unit generates a first light beam on which it modulates first data. The primary transceiver unit atmospherically transmits the first light beam to the optical router which demodulates the first data, modulates the first data on a second light beam and transmits the second light beam to the plurality of subscriber transceiver units in multiplexed manner. The subscriber transceiver units receive the second light beam and demodulate the first data from the second light beam. Conversely, the subscriber transceiver units atmospherically transmit a third light beam on which they modulate second data to the optical router which demodulates the second data, modulates the second data on a fourth light beam and transmits the fourth light beam to the primary transceiver unit. The primary transceiver unit atmospherically receives the fourth light beam and demodulates the respective second data from the fourth light beam. The optical router of the network comprises a secondary transceiver unit, a plurality of transceiver modules and an electronic router for routing data between the secondary transceiver unit and the plurality of transceiver modules to establish communication channels between the primary transceiver unit and the plurality of subscriber transceiver units. The secondary transceiver unit communicates with the primary transceiver unit and the transceiver units. The transceiver modules comprise an X-Y beam deflector for deflecting the second and third light beams to a portion of the subscriber transceiver units in a time-multiplexed fashion. In an alternate embodiment of the optical router, the first light beam is redirected to the subscriber transceiver units and the third light beam is redirected to the primary transceiver unit by a mirror and lens set assembly rather than being demodulated and modulated in the router. Applications such as telephony, the Internet, teleconferencing radio broadcast, HDTV, interactive TV, and other television forms are contemplated for employment on the network.

U.S. Patent No. 5,661,582 to Kintis et al. discloses a photonic interconnect and photonic processing apparatus for use in a communication and data handling satellite. The photonic interconnect and photonic processing apparatus includes a receiving device for receiving a plurality of input RF signals. An optical conversion device coupled to the receiving device converts the plurality of input RF signals to a plurality of input optical signals. This plurality of input optical signals is coupled to a plurality of input optical fibers. A distribution device optically coupled to the optical conversion device distributes at least one output optical signal from the plurality of input optical signals coupled to the plurality of input optical fibers. Then at least one output optical signal is coupled to at least one output optical fiber such that at least one output optical signal coupled to at least one output optical fiber is distributed within the communication and data handling satellite.

U.S. Patent No. 5,218,467 to Ross et al. discloses a satellite system for optical communications such as a multi-access laser transceiver system. Up to six low Earth orbiting satellites send satellite data to a geosynchronous satellite. The data is relayed to a ground station at the Earth's surface. The earth pointing geosynchronous satellite terminal has no gimbal but has a separate tracking mechanism for tracking each low Earth orbiting satellite. The tracking mechanism has a ring assembly rotatable about an axis coaxial with the axis of the field of view of the geosynchronous satellite and a pivotable arm mounted for pivotal movement on the ring assembly. An optical pickup mechanism at the end of each arm is positioned for optical

communication with one of the orbiting satellites by rotations of the ring.

U.S. Patent No. 5,119,225 to Grant et al. discloses a multiple access communication system comprised of a mode spacecraft and several user spacecraft. Each user spacecraft includes a transmit/receive terminal head and the mode spacecraft includes transmit/terminals and a single beacon unit. The beacon beam may be operated to initiate acquisition phases which allow two-way communication to be established between the transmit/receive terminals on the corresponding user terminals. The acquisition phases include a period during which the beacon scans an uncertainty cone associated with the mode spacecraft. The scanning period is reduced for second and subsequent acquisitions by using the first and subsequently acquired communication links to provide a more accurate estimate of the angular attitude of the mode spacecraft, thus reducing the extent of the uncertainty cone.

U.S. Patent No. 4,928,317 to Franchini discloses a radio-optical transmission system in particular for space telecommunications, comprising a radio-optical interface between a first modulated radio wave and a light wave wherein the transmitted light wave is subjected to wavelength modulation.

U.S. Patent No. 4,491,982 to Candy et al. discloses a terrestrial light beam communication system for compatible utilization with existing radio transmission systems. The transmitter utilizes aiming means and to control the aim of the transmitted light beam. The receiver employs an array of detectors from which a circuit determines the position of the received light beam. The position of the received light beam is used to control the position of the received light beam is used to control the position of the transmitted light beam from which control signals are developed to maintain the aim of the transmitted light beam to combat the occurrence of ongoing fluctuations in the vertical deflection experienced by the transmitted light beam.

International Publication Number WO 02/059674 A1 discloses a deformable curvature mirror capable of controlled deformation by applying electrical voltages to electrode segments on the back of the mirror. Two plates of an electro-restrictive material are joined together with at least one conductive layer sandwiched therebetween. One plate has an outer conductive layer and a mirrored surface on the outer conductive layer. The conductive layers are electrically grounded. The other plate has a pattern of a plurality of electrode segments on the outer surface with each electrode segment having a separate electrical terminal for applying a variable electrical voltage thereto for separately transmitting a variable current through each said electrode segment and through at least the other plate for causing variable expansion of the plate and thereby selectively deforming that plate and, in turn, the deformable curvature mirror.

The Physical Review Letters publication describes the dynamics of errors caused by atmospheric turbulence in a self-synchronizing chaos-based communication system that stably transmits information over a ~5 km free-space laser link that is studied experimentally. Binary information is transmitted using a chaotic sequence of short-term pulses as a carrier. The information signal slightly shifts the chaotic time position of each pulse depending on the information bit. The results of an experimental analysis of the atmospheric turbulence in the channel and the impact of turbulence on the bit-error-rate performance of this chaos-based communication system are reported.

The scientific publication entitled "Three-Dimensional Modeling of Optical Turbulence" describes the 1999 Scintillometer Atmospheric Test held in New Mexico, during which real-time forecasts of optical turbulence were produce on the NAVO Cray C-90 and transmitted via FTP to the meteorologist in charge of each day's pre-flight weather briefing. This represented the first operationally produced optical turbulence forecasts. The optical turbulence forecasts were enthusiastically received and incorporated into the pre-mission weather briefing. The exercise of the models resulted in an increase in the system robustness and sensitivity.

A separate listing of the above references on PTO Form 1449 and a copy of these references are enclosed herewith for the convenience of the Examiner.

The Commissioner is also hereby authorized to charge any fees required in connection with this document to Deposit Account No. 16-1340.

Respectfully submitted,

Dated: May 24, 2005

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CERTIFICATE OF MAILING UNDER
37 C.F.R. 1.8

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Thomas J Perkowski, Esq.
Date: May 24, 2005

Substitute for form 1449A/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

Sheet	1	of	4

Complete If Known	
Application Number	10/777,476
Filing Date	February12, 2 004
First Name Inventor	Alan Wirth et al.
Group Art Unit	2876
Examiner Name	n/a
Attorney Docket Number	108-205USA000

U.S. PATENT DOCUMENTS

Examiner Initials	Cite No.	U.S. Patent Documents		Name of Patentee or Applicant of Cited Document	Date of Publication of Cited Document MM-DD-YYYY	Intn'l Class / Sub Class
		Number	Kind Code (if known)			
		6,570,692		Doucet et al.	05/27/2003	H04B 10/00
		6,568,647		Graves et al.	05/27/2003	A47G 1/24
		6,559,993		Doucet et al.	05/06/2003	H04B 10/00
		6,464,364		Graves et al.	10/15/2002	G02B 26/00
		6,452,145		Graves et al.	09/17/2002	G01J 1/20
		6,373,607		Rivers et al.	04/16/2002	H04B 10/10
		6,348,986		Doucet et al.	02/19/2002	H04B 10/00
		6,323,980		Bloom	11/27/2001	H04B 10/00
		6,043,918		Bozzay et al.	03/28/2000	H04B 10/00
		5,801,866		Chan et al.	09/01/1998	H04B 10/00
		5,786,923		Doucet et al.	07/28/1998	H04B 10/00

U.S. PATENT DOCUMENTS						
Examiner Initials	Cite No.	U.S. Patent Documents		Name of Patentee or Applicant of Cited Document	Date of Publication of Cited Document MM-DD-YYYY	Intn'l Class / Sub Class
		Number	Kind Code (if known)			
		5,661,582		Kintis et al.	08/26/1997	H04B 10/00
		5,218,467		Ross et al.	06/08/1993	H04B 10/00
		5,119,225		Grant et al.	06/02/1992	H04B 10/00
		4,928,317		Franchini	05/22/1990	H04B 9/00
		4,491,982		Candy et al.	01/01/1985	H04B 9/00

PUBLICATIONS		
Examiner Initials	Cite No.	Description
		Scientific publication entitled "Chaotic Free-Space Laser Communication over a Turbulent Channel" by N.F. Rulkov, M.A. Voronstsov, and L. Illing, PHYSICAL REVIEW LETTERS, Vol. 89, No. 27, December 30, 2002, 4 pages.
		Scientific publication entitled "Three-Dimensional Modeling of Optical Turbulence" by Frank H. Ruggiero and Daniel A. DeBenedictis, Users Group Conference, 2000, pages 1-9.

FOREIGN PATENT DOCUMENTS								
Examiner Initials		Foreign Patent Document			Name of Patentee or Applicant of Cited Document	Date of Publication of Cited Document MM-DD-YYYY	Intn'l Class / Sub Class	T *
		Numbe r	Kind Code (if known)					
		WIPO	02/0059674 A1		Aoptix Technologies, Inc., Campbell, CA	08/01/2002		

EXAMINER **DATE CONSIDERED**

EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance not considered. Include copy of this form with next communication to applicant.

(INFORMATION DISCLOSURE STATEMENT – SECTION 9 PTO-1449)